

Study of dielectric properties of bio-potential for precursory signature of seismic activities

Ravish Sharma¹, Rudraksh Tiwari², Kash Dev Sharma³

¹Assistant Professor, Department Of Physics, Babu Shivnath Agarwal (P.G.) College, Mathura

²Assistant Professor, Department Of Physics, Babu Shivnath Agarwal (P.G.) College, Mathura

³Assistant Professor, Department Of Physics, Babu Shivnath Agarwal (P.G.) College, Mathura

Corresponding Author Orcid ID : <https://orcid.org/0009-0003-7431-7123>

ABSTRACT

Sudden changes occur in the environment due to atmospheric variations (seasonal variations, drought, rainfall, humidity, floods and seismic activities) is a matter of discussion. When the sensing was done by nature and human bodies like mammals, animals and trees adopt the abnormal phenomena in the respect of amplitude enhancement and change the behaviour. The seismogenic ULF emissions, plasma anomalies, ionospheric perturbations and bio-electric potential was affected in respected of surrounding environment and helps us in understanding the mechanism of natural hazards. The bio-potential of the internal medium lies in the scope of -90mV to 40 mV relative to the external medium. We used live sensor for observing the D.C. amplitude enhancement (~50 mV) which helps us in analyzing the precursory signature of seismic activities. We have observed the dielectric properties of live sensor (dielectric constant (ϵ) and dielectric loss (ϵ''), relaxation time (τ), impedance (Ω), frequency response (f) and conductivity (σ)) of deep rooted trees. These results have been reported here and trying to observed the change in deep rooted trees before-mid-after the commencement of seismic activity having the energy of the order of ($M = 0.08 \times 10^8$ ergs/sec.) in the form of electromagnetic waves. Due to this effect the internal structure of tree has been changed and shows a strong resemblance between them. We have observed the basic changes in deep rooted trees in the form of change in bio-potential and the results were highlighted the response by analyzing the dielectric properties of the same trees and establishing a profound relation which help us in determining the precursory signature of earthquakes.

Keywords: Seismo-Electromagnetics, Dielectric Constant, Dielectric properties, Bio-potential, magnetic storms, earthquake etc.

1. INTRODUCTION

In recent times, the dielectric property acquires an important place in different research laboratories for the study of their various aspects. The dielectric properties of wood have both theoretical and practical importance. In theoretically, they give a better understanding of the molecular structure of wood and wood-water interactions. The practical applications of the dielectric properties are the density and moisture content of wood can be determined non-destructively. That is why the dielectric properties of tree roots are important and well known to be strongly influenced by the gravimetric moisture content defined as the ratio between the mass of the wet contained within the material and therefore the total mass of the wet material. It has also been reported that knots, spiral grain, and other defects can be detected by measuring dielectric properties (Martin et al. 1987). When wood is placed in an electrical field, the current-carrying properties of the wood are governed by certain properties, such as moisture content, density, grain direction, temperature; and by certain components such as cellulose, hemi-cellulose and the lignin of wood. They conjointly vary in a very sophisticated fashion with frequency.

The overall effects of those parameters act with one another and raise the complexities of the material properties. The temperature dependence of wood's dielectric properties has been reported earlier by some workers using a few tropical and temperate wood species (James 1968, 1975, 1977; James and Hamil 1965; Tsutsumi and Watanabe 1965; Nanassy 1964, 1970). The effect of

temperature on the dielectric properties at microwave frequencies has also been reported by (Tinga 1969). As the moisture content of branches shows significant diurnal and seasonal variations, their dielectric properties are also strongly time dependent (Sarabandi 1992). Remote Sensing is one of the fundamental techniques used for environmental, agricultural and military purposes. For the previous couple of decades, microwave radiometers have played an important role in monitoring the earth environment such as atmosphere, ocean and soil.

Rainfall, water vapour and sea surface wind can be retrieved with the radiometer; especially vertical and horizontal electromagnetic fields of the target provide additional information for more accurate estimation. Its elementary relies on understanding the linkage between magnetism and physical properties of the sample. These basic properties are important for radar response (Nashashibi and Sarabandi 1996, Ulaby et al., 1987, Marr et al., 2006). The mechanism of electromagnetic wave energy on biomass involves the transport of the electrical charges by the ions present in the biomass cell wall and cellulose. Once the electromagnetic wave energy is encountered the biomass, randomly oriented dipoles in dielectric material align themselves in a direction opposite to applied external electric field. The molecules absorb the energy and store as mechanical energy. Toriyama successfully predicted Miyagi offshore earthquake in 1994 by measuring the tree potential. Terrestrial and bio-potential signals are recorded for the same time and it was observed that any seismic activity occur will create a change in the abnormal signal and will recorded either in terrestrial antenna or in Electronic Poly recorder for bio- potential measurement (Kushwah et al., 2013). This paper deals with variation of dielectric properties such as dielectric constant, dielectric loss, impedance, capacitance of banyan tree and ashok tree at various frequencies and helps us in finding the precursory signature of seismic hazards. Numerous investigations done here to foresee present day and additionally chronicled tremors, the vast majority of them from structural plate hypothesis, Jacoby and Ulan 1983, may be a couple were discovered proof for known seismic tremors from intra plate deficiencies, Carrara and O' Neill 2010. Rings of the tree help us in understanding the seismic tremors and decrease the effects by pre-identification of such occasions and by elucidating them one can decide the epicentre, greatness and timing. (Jacoby et al., 1998. Paleoseismic thinks about are uncommon yet an unmistakable model is the recognizable proof of already obscure, tremors, Tsunami and so forth. Tree-ring information including demise dates, development rates before death and ring width changes. In another paleoseismic examine, ancient seismic tremors were assessed by C-14 dating process.

Rings are shaped in the storage compartment, branches and real roots. Rings are the storage compartment of a tree is more dependable for investigation. We will audit here to delineate the ideas of cross dating and perceiving signals that may be because of seismic impacts. The investigation of tree ring is valuable in paleoseismology at various areas where topographical, surface break, hydrologic unsettling influence, increasing speed and removal because of a seismic tremor will likewise influence the tree development. Date of a seismic tremor can be affirmed by an individual tree. The data of the measure of the seismic tremor or surface break was educated by the system of exasperates tree. The profundity, size, geographical highlights, degree, sort of a seismic tremor and its area in respect to the tree site. Quakes can influence straight forwardly to surface burst, rise change, increasing speeds, and relocation. Seismic tremor can likewise cause auxiliary impacts, for example, Tsunami's, liquefaction and avalanches. Trees like bristlecone pine, Douglas fir, uncovered cypress, redwood, eastern white cedar in North America and Banyan tree, pipal tree and a few animal varieties in India and Asia that live for 800 to 1000 years or more, where tree ring investigation has not been widely attempted. One of the principal challenges in exploitation tree rings to spot earthquakes is finding trees that have recorded the event. Many studies have centered on "event response" trees, which exhibit obvious damage and are located within a few meters of a fault scarp. This technique may increase the probability of finding a response in a given tree, and certainly makes it easier to attribute the response to an earthquake rather than some other factor. However, (Bekker 2004) studied spatial variation in tree-ring responses to the 1959 Hebgen Lake (Montana) earthquake and found that: (1) trees that recorded a response in their rings did not continuously show external damage; (2)

distance from the fault scarp, up to 58 m, had little effect on the proportion of trees recording a response; (3) trees below the scarp, on the downthrown block, were much more likely to record a response than those on the stationary block above the scarp. These results suggest that dendro-seismological studies can benefit from a research design that includes sampling over broader areas (at least tens of meters from a scarp), recording the position of trees relative to scarps, and sampling a range of tree sizes and ages. Such a style would need bigger care to spot management trees, but would increase the likelihood of finding trees with a response and may reveal details about block movement for an unknown quake. Another potential thanks to expand the identification of earthquakes through tree ring analysis is by examining the consequences of seismologically-induced landslides (Carrara and O'Neill 2003, 2010). Landslides can be triggered hundreds of kilometers from an earthquake's epicentre and can damage trees over a much more extensive area than that produced by shaking alone. This technique will, however, require independent evidence of a synchronous earthquake, and care to rule out climatic or other potential triggers of landslides. It is acknowledge that a tree might respond otherwise to Associate in Nursing earthquake around its circumference, as with the formation of reaction wood when trees are tilted. (Hamilton 2010) notes that trees may also show differing responses vertically on the stem. He found proof of the 1700 Cascadia and 1959 Hebgen Lake earthquakes by sampling many meters on top of the bottom, where trees are more likely to be directly damaged by acceleration and whiplash. (LaMarche and Wallace 1972) also noted that dating leaders on a broken stem could precisely date the timing of such damage from an earthquake. Sampling trees during this method might reveal responses that aren't recorded close to the bottom. Most studies of tree-ring responses to earthquakes have appropriately been conducted along plate boundaries, where most earthquakes occur and human population densities are high. However, major intraplate quakes threaten massive populations close to many faults in China, the Wasatch Fault in Utah, and the New Madrid Fault in the Midwestern U.S. among others. Recurrence possibilities for earthquakes on intraplate faults also are tough to estimate as a result of the forces behind them are typically poorly understood and movement is a smaller amount consistent than at plate boundaries. Thus, dendroseismological studies could also be notably valuable in informative the behaviour of intraplate faults. The structural changes in the tree (rings) may be a factor in predicting natural hazards like earthquake. Tree ring impact in beginning of seismic risks and may bring about lessening rings when presented to seismic dangers. This decimation in rings of the tree turn into a valuable sign in basic change and may help us in deciding a pre-seismic movement. We found very interesting results which give explanation one by one in different years and for different time.

2. MATERIALS AND METHODS

We have observed the dielectric properties of latex of banyan tree and ashok tree measured with the help of Hi-Tester Meter we calculate the dielectric constant (ϵ) and dielectric loss (ϵ'), relaxation time (τ), impedance (Ω), frequency response (f) and conductivity (σ) at room temperature ranging from 500 Hz to 16000 Hz. The mechanism of electromagnetic wave energy on biomass involves the transport of the electrical charges by the ions present in the biomass of tree. Once the electromagnetic wave is encountered the latex, randomly oriented dipoles in dielectric material align themselves in a direction opposite to applied external electric field. The molecule absorbs the energy and store as potential energy. By the mechanism of ionic conductivity and dipole rotation, polar molecules vibrate and produce kinetic energy. Dielectric properties can be studied on the energy that is reflected, transmitted through the surface and absorbed by the materials. Each style of energy is specific with its term. Dielectric constant (ϵ) is the ability of material to store electric energy was discussed by (S. Ramasamy and B. Moghtaderi, 2010). Dielectric loss (ϵ') is the ability of material to convert the electromagnetic energy into heat was clearly explained by (A. A. Salema.et. al, 2013)

For bio-potential measurement we use an Electronic poly recorder imported from Japan. It is used to record the change in internal characteristics (xylem/ phloem) of trees and represent it in the graphical form.



FIGURE1. LCR Hi-Tester Meter

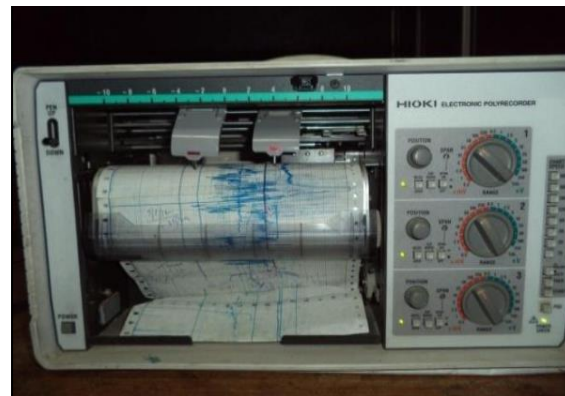


FIGURE 2. Electronic Poly recorder

3. RESULTS AND DISCUSSION

We performed an experiment at frequency from 500 Hz to 16000 Hz for investigate the effect of frequency on dielectric properties of latex of banyan tree and the results are shown in Fig.3 It shows the relationship between dielectric constant and frequency for all directions. When frequency was increased from 500 Hz to 16000 Hz, dielectric constant was decreased for all of the latex of banyan tree and ashok tree. The result depicted that electric field of electromagnetic wave affected the interaction of latex of biomass with electromagnetic waves. When the frequency increased, a continuous varying electric field was created. This varying electric field created polarization in latex of banyan tree and ashok tree. Dipole moment in biomass gradually decreased as frequency increased. Therefore, dipole had shorter time to realign itself according to the oscillating electric field was discussed by A. A. Salema.et. al., 2013 and Z. Ahmad 2012. Conductive effect of electromagnetic wave heating also diminished quickly in high frequency was clearly explained by R. Omar et.al, 2011. Hence, dielectric constant which indicated the ability of material to store electric energy decreased. We have shown that the (SES) bio-potential signal with dielectric constant at low frequency signal received by banyan tree and ashok tree. In fig.3 we have clearly seen that the banyan tree and ashok tree have good frequency response, their dielectric constant was over 700 at 500 Hz which is more in comparison to the other trees. As we know that when frequency is less than the wavelength is more and vice-versa. It means that long ages banyan tree can store more electric charge in comparison to other trees and on increasing frequency it becomes low, (less ability to store charge). When the ULF wave's approaches during the early phase of seismic hazards like earthquake, these waves diminish the latex present in the banyan tree and affect the xylem to phloem concentration of the banyan tree which is constant in long age's tree and serve as a tool to find the precursory signature of an earthquake.

Dielectric loss of all latex of banyan trees was increased when the frequency increased from 500 Hz to 16000 Hz beyond 100 Hz, the dielectric loss was slightly increased with the increasing of frequency. This dielectric loss trend was observed due to electrical conductivity of latex of banyan trees was different at varying frequency as reported in an earlier study by A. A. Salema et. al., 2013. Dielectric loss is the ability of the material to convert electric energy into heat, during the seismic hazards the energy absorbed by the latex of banyan trees the loss is increased means the signals or the waves received will convert into heat and affect the concentration of xylem to phloem which will helps us in finding the precursory signature of an earthquake. In banyan trees the dielectric loss is increasing rapidly with increasing frequency means the energy converted into heat is more in long ages tree, more heat generated due to high dielectric loss which will affect the tissues of tree roots i.e.

xylem and phloem In Fig.4 we see clearly that the banyan tree have highest dielectric loss in comparison to other trees. On increasing frequency the dielectric loss was increasing means more absorbed energy is converted into heat and serves as the informative tool for finding the precursory signature of such hazards.

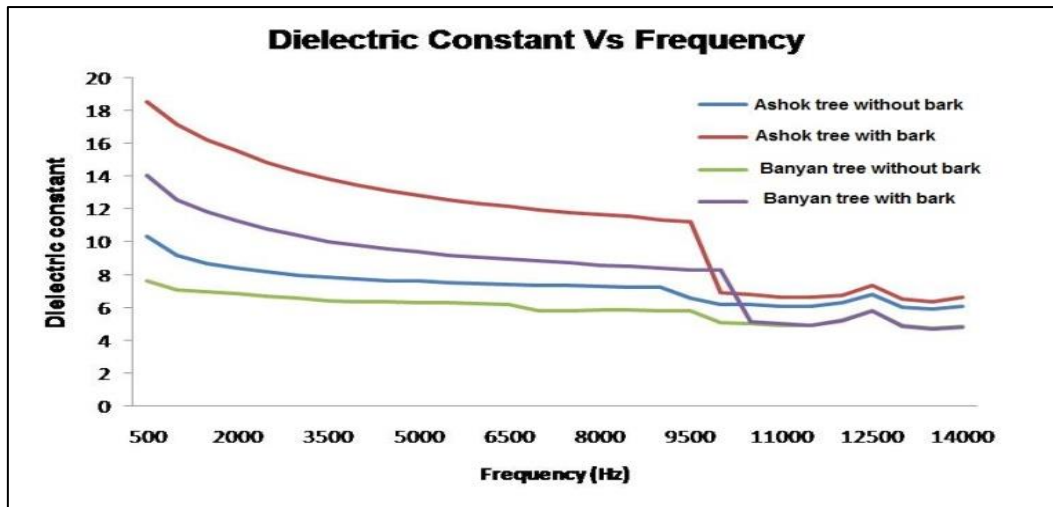


Figure 3 Showing the dielectric constant at various frequency by banyan tree and ashok tree.

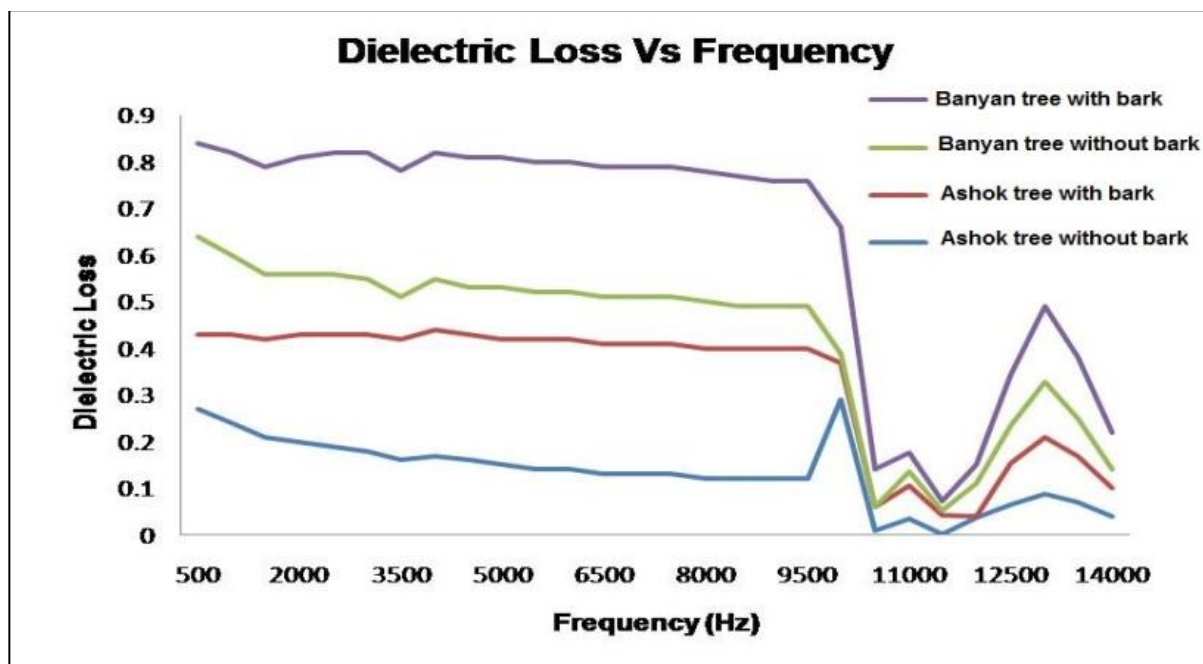


Figure 4 Showing the dielectric loss at various frequency by banyan tree and ashok tree.

In figure 5, we have calculated impedance (Ω) of latex of banyan trees at various frequencies. We have found that the impedance of all the latex was decreasing on increasing the frequency from 40 Hz to 16000 Hz. We know that if the impedance of the material is decreasing with the increase in frequency, the value of current is increasing at the same frequency. Tsarev and Sasaki (1999) have reported in model calculation that the electromagnetic signals may be propagated to a long distance (>1000 km) in middle layer crust working as a waveguide. The signal (value of current) generated during the seismic activity will affect the tree and hence by measuring the change in dielectric properties we are in a position to give the correct explanation of any seismic hazard.

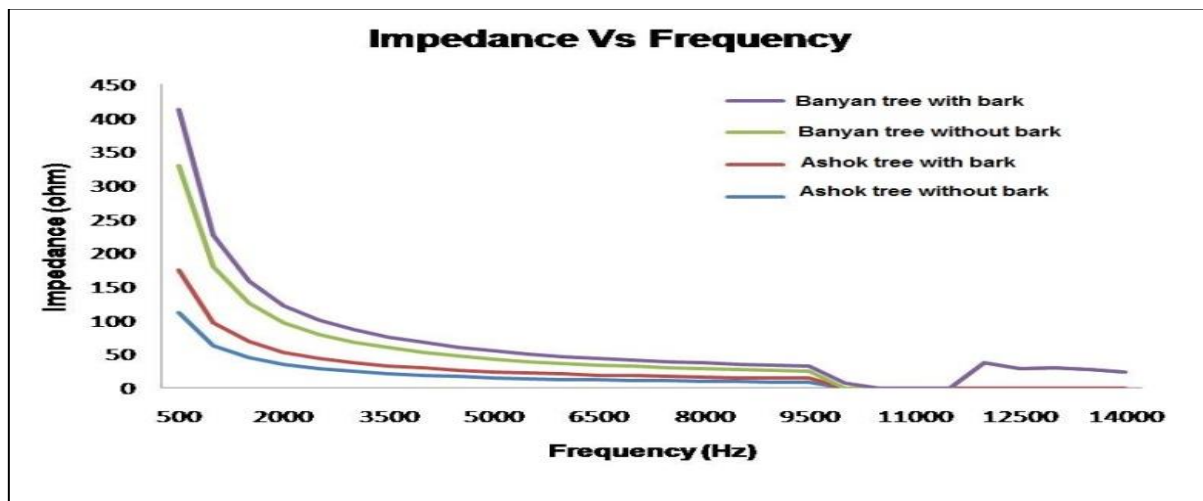


Figure 5 Showing the impedance at various frequency by banyan tree and ashok tree.

We have calculated the conductivity of banyan tree and ashok tree and found that the conductivity of ashok tree and banyan tree is increasing with increase in frequency till the first relaxation is achieved shown in fig. 6 and after relaxation it will continue the same strand.

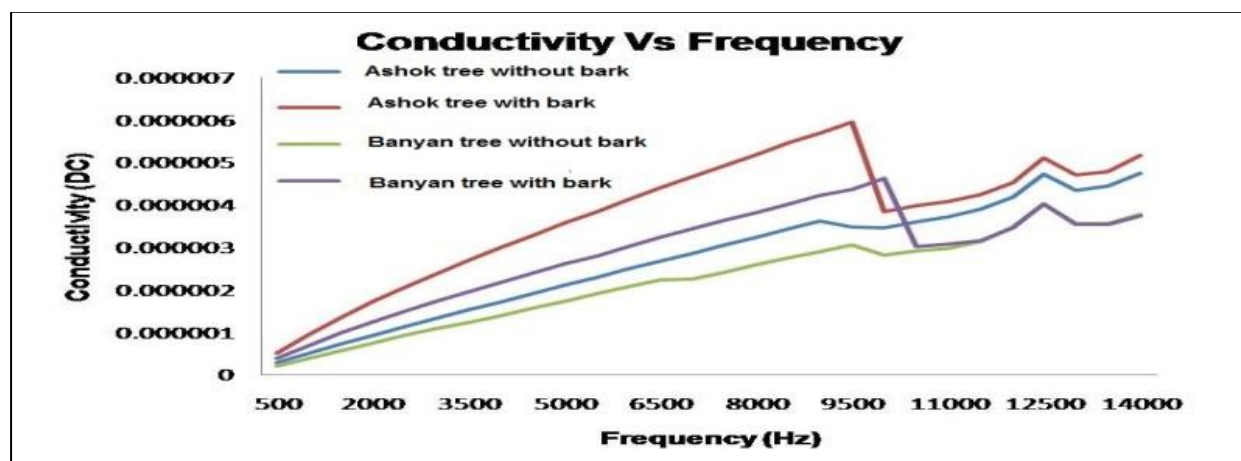


Figure 6 Showing the conductivity at various frequency by banyan tree and ashok tree.

We have also observed the relaxation time in respect of frequency for banyan tree and ashok tree and found that on increasing frequency the relaxation time was decreasing.(fig.7)

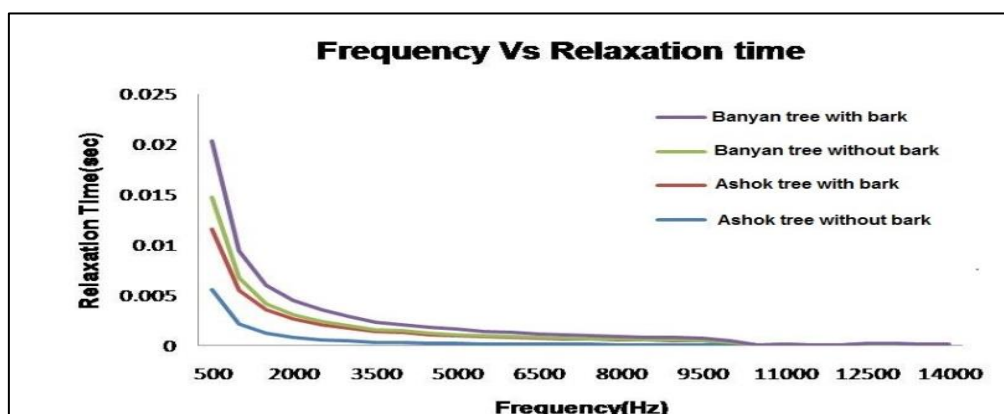


Figure 7 Showing the relaxation time at various frequency by banyan tree and ashok tree.

We have analyzed dielectric properties of latex of different trees and verifies the terrestrial and bio-potential signal received. It is proved that when two types of latex is available from two types of trees one is lower edge and shallow depth and other is old age and deep rooted. As we know that when the age of the tree succeeds, then the latex of the tree becomes more concentrated in comparison to lower age tree. The similar type of analysis has been recorded on human blood by M.S. Gaur 2007.

When electromagnetic wave energy is just near the circular radius of tree, the root absorbs electromagnetic energy which directly affects the latex and the loss has been increased due to increase of frequency, this mechanism is similar to human nature of all circumstances with pressure of different ages. The result depicted that electric field of Hi-Tester Meter affected the interaction of latex and electromagnetic waves. When the frequency increased, a continuous varying electric field was created. This varying electric field created polarization in Latex. Hence, dielectric constant which indicated the ability of material to store electric energy decreased.

Dielectric loss (ϵ'') is that the ability of fabric to convert the magnetism energy into heat. Dielectric losses of all the trees used in study were increasing when the frequency increased from 10^3 to 10^5 Hz. Beyond 10^4 Hz, the dielectric loss was slightly increased with the increasing of frequency. This dielectric loss trend was observed due to electrical conductivity of long ages Banyan Tree and ashok tree was different at varying frequency as reported in an earlier study (Salema et al., 2013). When the seismic activity occurs the dielectric loss increases because the electromagnetic waves diminish the latex of tree as reached in contact with deep rooted trees like Banyan Tree. We have observed the bio-electric potential of banyan tree and record the signal as a transient change of xylem/phloem concentration. Electronic Polyrecorder (EPR-3531) imported from Japan for recording the biopotential signal with respect to time. We found that during seismic activity the biopotential data was enhanced and becomes a pre indicating source of seismic tremor. (fig.8)

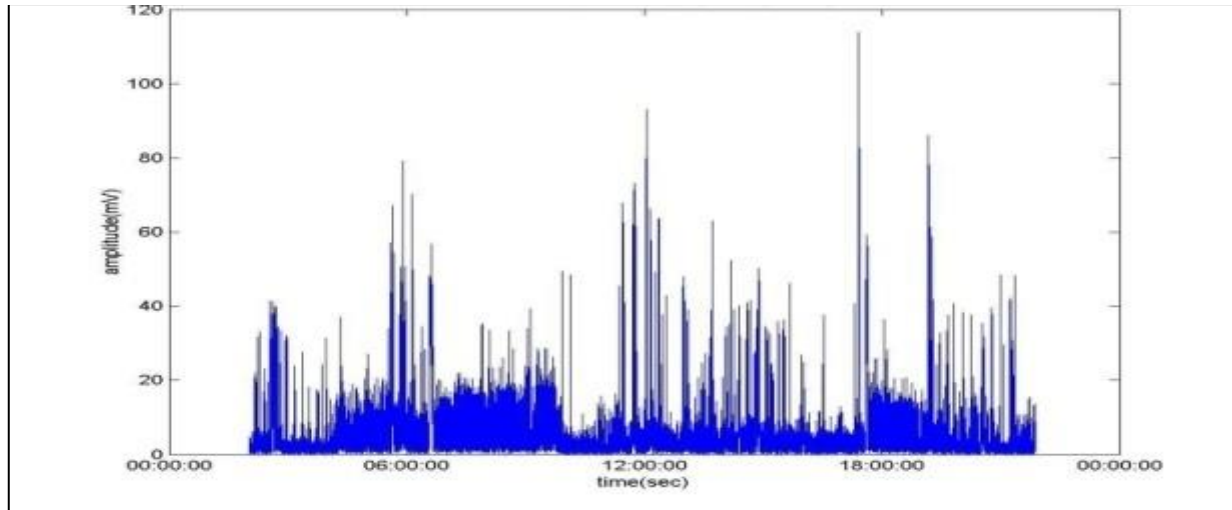


Figure 8. Demonstrates the flag blasts of varying amplitudes recorded by Bio-potential Antenna recorded at Mathura

4. CONCLUSIONS

The field of seismo-electromagnetic is characterized by investigations of electromagnetic wonders and influence related with tremors for purpose of brief time quake forecast. The quantity of occasions of seismo-environmental and seismo-ionospheric bothers is adequate for factual connections with tremors. We have studied that structural and dielectric properties of large tree (banyan and ashok tree) and found that by viewing the damage in ring structure of the tree we are able to predict the precursory signature of seismic event. We have observed that by analyzing dielectric properties of latex of large trees like banyan and ashok tree with different computerized reasoning displaying which have given the preliminary mark seismic tremors for the investigation of figure reason in future. This new science

field is extremely intriguing, appealing and testing from a logical perspective as well as is of potential significance as a promising possibility for here and now seismic tremor forecast to moderate quake catastrophe in quake inclined zones. It might be certain that the accompanying system of antecedents of seismic tremor happen 10 to 14 days before substantial quake and have been watched and utilized for tremor expectation in detached case.

ACKNOWLEDGEMENT

The authors are thankful to Ministry of Earth Science, India Meteorological Department, New Delhi. We are also thankful to Prof. M.S. Gaur (Dean R&D Hindustan College Mathura) and Dr. Vinod Kumar Kushwaha (Associate Prof. Hindustan College Mathura) for supporting the research activities and also thanks for our research department for co-operate the research work.

REFERENCES

1. Tsarev, V. A. and Sasaki. V. (1999) Low frequency seismogenic electromagnetic radiation: How does it propagate in earth's crust and where it can be detected? In: M. Hayakawa (ed.), Atmospheric and Ionospheric Electromagnetic Phenomena Associated with Earthquakes." Terra Scientific Publishing Co., Tokyo, 383.
2. Gaur, M. S., Tiwari, R.K., Shukla, P., Saxena, P., Gaur, K., and Tiwari, U. (2007) Thermally Stimulated current analysis in human blood, Trends in Biomaterials, Artificial Organs. **21**, 1, 8-13.
3. James, W. L. (1968) Effect of temperature on readings of electric moisture meters, Journal of Forest Production. **18**, 10, 23–31.
4. James, W. L. (1975) Dielectric properties of wood and hardboard, Variation with temperature, frequency, moisture content, and grain direction, U.S. Department of Agriculture, Forest service, Journal of Forest Production, Laboratory Madison. Research Paper, FPL-245.
5. James, W. L. (1977) Dielectric behavior of Douglas-fir at various combinations of temperature, frequency, and moisture content, Journal of Forest Production. **27**, 6, 44–48.
6. James, W. L., and HAMIL. D. W. (1965) Dielectric properties of Douglas-fir measured at microwave frequencies, Journal of Forest Production. **15**, 2, 51–56.
7. Kushwah. V., Tiwari Rudraksh., Gaur, M.S., Tiwari, R.K. (2013) Initial results of biopotential signal (Seismic Electric Signal) related to seismic activities in Acta Geophysica. 61,4,935-949.
8. Martin, P., Collet, R., Barthelemy and Roussy. G., (1987) Evaluation of wood characteristics: Internal scanning of the material by microwaves, Wood Science Technology. **21**, 4, 361–371.
9. Omar, R., A. Idris, R. Yunus, K. Khalid, and. M. I. A. Isma (2011) Characterization of empty fruit bunch for microwave-assisted pyrolysis, Journal of Fuel. **90**, 4, 1536–1544.
10. Ramasamy S., and Moghtaderi. B. (2010) Dielectric properties of typical Australian wood based biomass materials at microwave frequency, Journal of Energy Fuels. **24**, 12, 4534–4548.
11. Salema, A. A., Yeow, Y. K., Ishaque, K., Ani, F. N., M., Afzal, T. and Hassan. A. (2013) Dielectric properties and microwave heating of oil palm biomass and biochar, Journal of Industrial Crops Production. **50**, 366–374.
12. Tinga, W. R. (1969) Dielectric properties of Douglas-fir at 2.45 GHz, Journal of Microwave Power. **4**, 3, 162–164.
13. Tsutsumi, J., and Watanabe, H., (1965) Studies on dielectric behavior of wood. I. Effect of frequency and emperature on ϵ' and ϵ'' . Mokuzai Gakkaishi. Journal of the Japan Wood Research Society, 11, 6, 232– 236.
14. Ahmad, Z. (2012) "Polymer dielectric materials", "Dielectric Material", book edited by Marius Alexandru Silaghi, ISBN 978-953-51-0764-4, Published: October 3, 3–26. DOI: 10.5772/50638.
15. Nashashibi, A. and Sarabandi, K. (1996) "A bistatic measurement technique for characterization of the effective dielectric constant of random media using a monostatic radar," IEEE Transactions on Geoscience and Remote Sensing, 172–177.

16. Ulaby, T. B. A., Sarabandi, K., and Ulaby, F. T. (1987) "Measuring and modeling the backscattering cross-section of a leaf," *Radio Science*, Vol. 22, 1109–1116.
17. Marr, R., Lammers, U. H. W., Hansen, T. B., Tanigawa, T. J. and McGahan, R. V. (2006). "Bistatic RCS calculations from cylindrical near — Field measurements —Part II: Experiments," *IEEE Transactions on Antennas and Propagation*, Vol. 54, No. 12, 3857– 3863.
18. Sarabandi, K., (1992) "Scattering from dielectric structures above impedance surfaces and resistive sheaths," *IEEE Transactions on Antennas and Propagation*, Vol. 40, 67–78.
19. Jacoby GC, Ulan LD (1983) Tree ring indications of uplift at Icy Cape, Alaska, related to 1899 earthquakes. *J Geophys Res* 88:9305–9313 Jacoby GC, Ulan LD (1983) Tree ring indications of uplift at Icy Cape, Alaska, related to 1899 earthquakes. *J Geophys Res* 88:9305–9313.
20. Carrara PE, O'Neill JM (2010) Tree-ring dated landslide movements and seismic events in southwestern Montana, U.S.A. In: Stoffel M, Bollschweiler M, Butler DR, Luckman BH (eds) *Tree rings and natural hazards: A state-of-the-art*. Springer, Berlin, Heidelberg, New York, this volume.
21. Jacoby GC, Bunker DE, Benson BE (1997) Tree-ring evidence for an A.D. 1700 Cascadia earthquake in Washington and northern Oregon. *Geology* 25:999–1002.
22. Bekker MF (2004) Spatial variation in the response of tree rings to normal faulting during the Hebgen Lake Earthquake, southwestern Montana, USA. *Dendrochronologia* 22:53–59.
23. Carrara PE, O'Neill JM (2003) Tree-ring dated landslide movements and their relationship to seismic events in southwestern Montana, USA. *Quat Res* 59:25–35.
24. Hamilton WL (2010) Seismic damage in conifers from Olympic and Yellowstone National Parks, United States. In: Stoffel M, Bollschweiler M, Butler DR, Luckman BH (eds) *Tree rings and natural hazards: A state-of-the-art*. Springer, Berlin, Heidelberg, New York, this volume.
25. LaMarche VC, Wallace RE (1972) Evaluation of effects on trees of past movements on the San Andreas Fault, northern California. *Geol Soc Am Bull* 83:2665–2676.
26. Nanassy, A. Z. (1964) Electric polarization measurement on yellow birch, *Canadian Journal of Physics*. 42, 6, 1270–1281.
27. Nanassy, A. Z. (1970) Overlapping of dielectric relaxation spectra in oven-dry yellow birch at temperature from 20o C to 100°C, *Wood Science Technology*. 4, 104–121.
28. Study the bio-potential parameter for detection of seismic and environmental changes in Indian region, RudrakshTiwari, Vinod Kumar Kushwah and M.S. Gaur published in *Journal of Geography and Cartography* in 2018.
29. Precursory response of low frequency signals for detection of seismic rapture in Indian region. Vijay Subhash Katta, Vinod Kushwah, PritiDimri, RudrakshTiwari published in *International Journal of Innovative Technology and exploring engineering (IJITEE)* in ISSN: 2278-3075, Volume-8, Issue-9, July, 2019.